

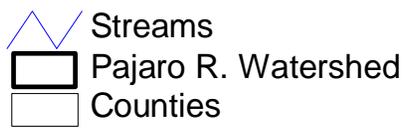
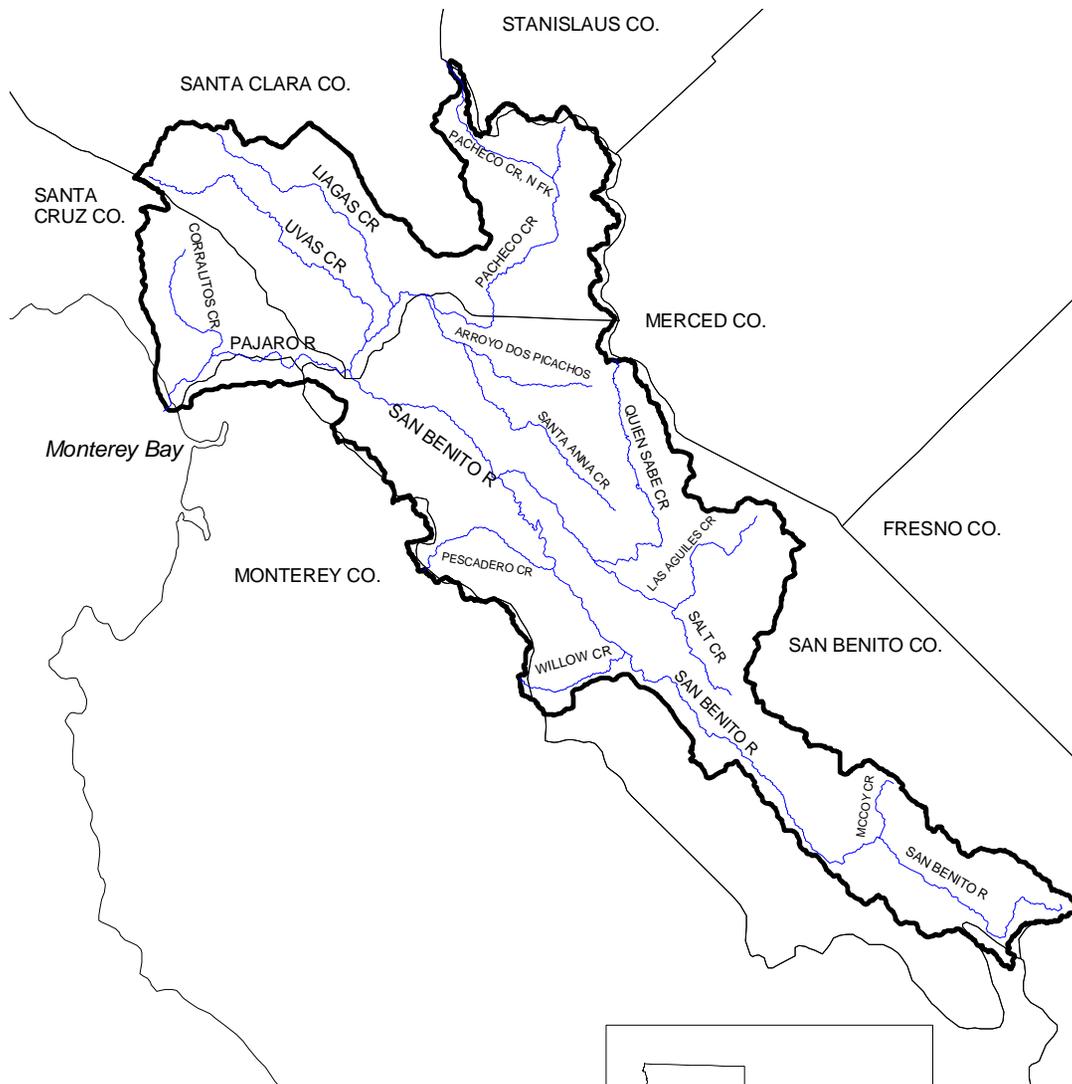
Pajaro River Total Maximum Daily Loads (TMDLs) for Sediment and Land Disturbance Prohibition

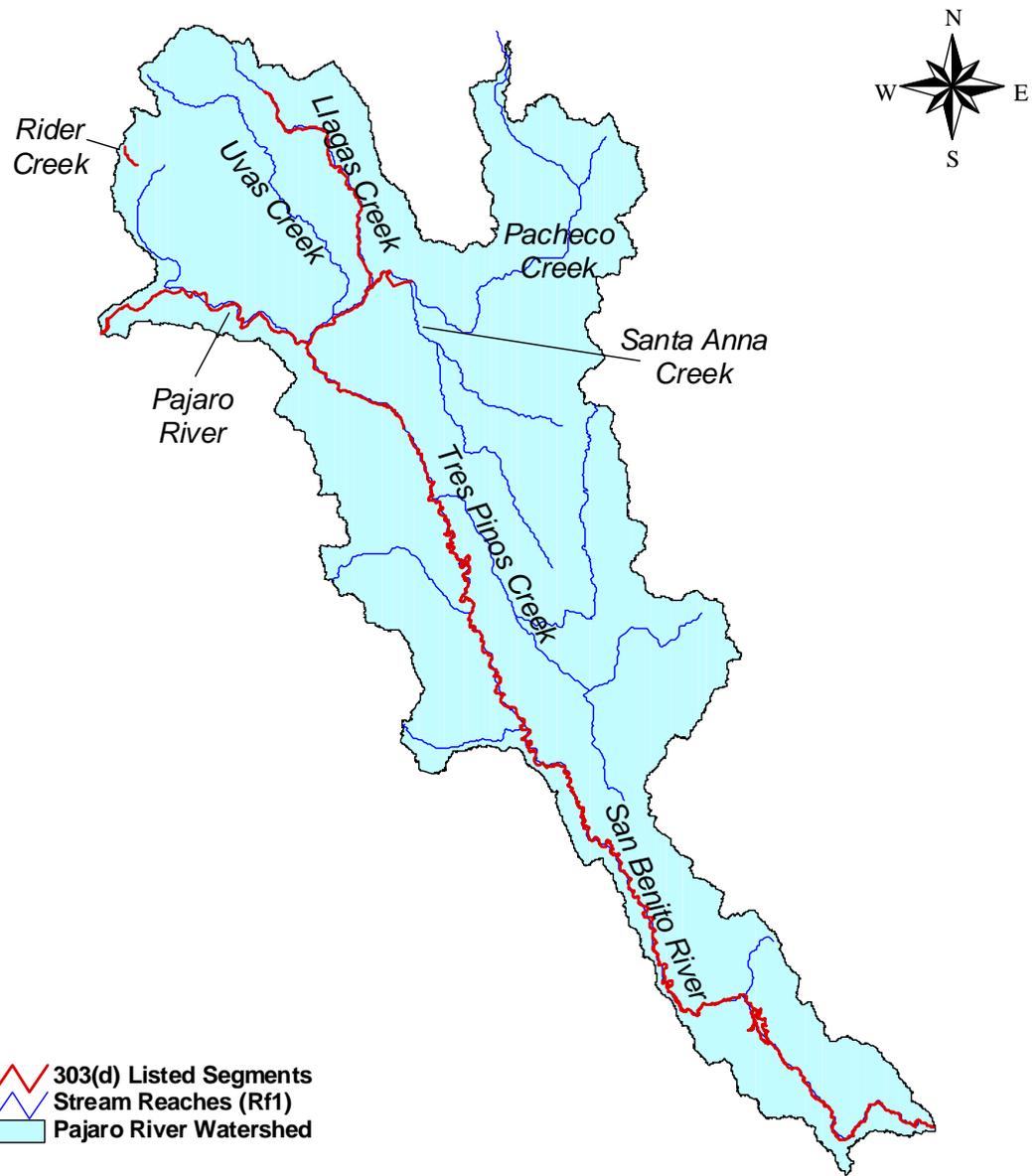
Agenda Item #10

Presented by
Michael Buckman

Intro

- 2002 303(d) listing: Sedimentation
- Impairing:
 - Cold Fresh Water Habitat (COLD)
 - Migration of Aquatic Organisms (MIGR)
 - Spawning, Reproduction, and/or Early Development of Fish (SPWN)
- Narrative Water Quality Objective





 303(d) Listed Segments
 Stream Reaches (Rf1)
 Pajaro River Watershed

0 10 20 Miles

Sources:
RWQCB
EPA's BASINS
Map Projection: Albers Equal Area

TMDL Targets

- Streambed characteristics
- Suspended sediment concentration and duration

Streambed Numeric Targets

- Sediment accumulation (pool volume)
- Sediment distribution in spawning gravels

Suspended Sediment Numeric Targets

Major Subwatershed ^a	Exposure Category ^b		Exceedance Event Criteria		Numeric Targets ^c	
	Duration (consecutive days)	Suspended Sediment Concentration Range (mg/L) ^d	Duration (consecutive days)	Suspended Sediment Concentration (mg/L)	Maximum Number of Exceedance Events	Maximum Duration of any given Exceedance Event (consecutive days)
Upper Pajaro	1	666 – 1808	2	>1808	0	1
	2	245 – 665	3	>665	3	3
	6	91 – 244	7	>244	2	9
	14	91 – 244	15	>244	0	9
	49	33 – 90	50	>90	0	33

Source Analysis

- Primarily Nonpoint Sources
 - Agricultural Operations
 - Silviculture
 - Urban/Residential Land Use
 - Rangeland & Grazing Activities
 - Sand & Gravel Mining Operations
 - Streambank Erosion
 - Roads
 - Natural Erosion

Roads



Agriculture



Urban





Natural Erosion

Source Analysis (cont.)

- Point Sources
 - Small Municipal Separate Storm Sewer Systems (MS4s)
 - Watsonville
 - Hollister
 - Gilroy
 - Morgan Hill

Allocations

Major Subwatershed	Allocations (LA/WLA)	Source Category							Total Load
		Crop, Fallow, and Orchard	Forest	Pasture and Range	Urban Lands	Roads	Barren	Sand and Gravel Mining	
San Benito	LA	1971	2083	19863	327	1180	14128	27	39,679
	WLA				100				

Implementation

Agricultural and Timber lands:

- Conditional Waivers for Irrigated Agriculture and Timber Harvesting

Urban:

- Stormwater permits (urban lands)

Sand and Gravel Mining:

- Waste discharge requirements

Implementation (cont.)

Pasture and Range Lands, Roads, Rural Properties, and Hydromodification:

- Land Disturbance Prohibition
 - Prohibits discharge of sediment
 - Requires dischargers to develop control programs or eliminate discharge
- Consistent with NPS Policy

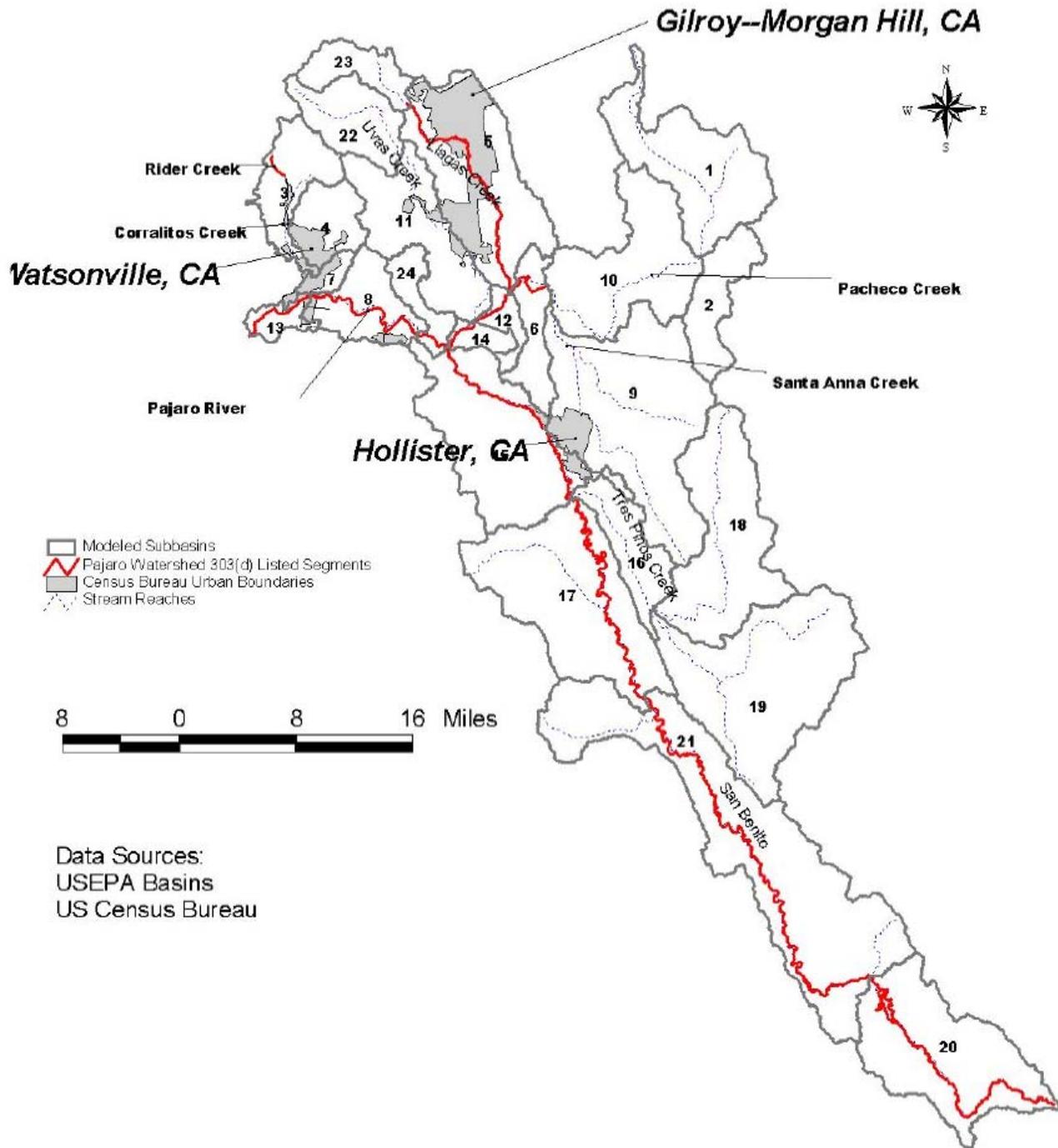


Issues



Questions

Extra Slides Below



Major Subwatershed (Subbasin numbers)	Allocations ¹ (LA/WLA)	Land Use Source Category							Total Load
		Crop, Fallow, and Orchard	Forest ²	Pasture and Range	Urban Lands ³	Roads	Barren ²	Sand and Gravel Mining	
Tres Pinos (16, 18, 19)	LA	477	352	41085	312		11551		53,778
	WLA				1				
San Benito (15, 17, 20, 21)	LA	1971	2083	19863	327	1180	14128	27	39,679
	WLA				100				
Llagas (5, 23)	LA	596	326	6978	354		144		9,185
	WLA				787				
Uvas (11, 22)	LA	946	989	12454	280		369		15,177
	WLA				139				
Upper Pajaro (1, 2, 9, 10)	LA	4114	1228	37664	356		425	3	43,951
	WLA				161				
Corralitos (3,4) (including Rider Creek)	LA	3544	4536	2427	443	79	73	2	11,389 ⁴
	WLA				284				
Mouth of Pajaro (6, 7, 8, 12, 13, 14, 24)	LA	3047	58	3055	383		500	35	7,268 ⁴
	WLA				191				

Notes:

¹ Annual load allocations (LA) and waste load allocations (WLA) expressed in metric tones (1 metric ton equals 1,000 kilograms). Allocations are the portion of a receiving water's loading capacity attributed to one of its existing or future pollution sources. Load allocations are assigned to nonpoint sources or to natural background levels and wasteload allocations are assigned to point sources.

² Forest includes loads from natural sources and from timber harvesting operations; Barren includes loads from natural sources only.

³ Load allocations for urban lands outside of NPDES Phase 2 urban boundaries. Waste load allocations for urban lands within NPDES Phase 2 urban boundaries.

⁴ Number rounded.

Streambed Characteristics

Parameter	Numeric Target¹
Residual Pool Volume ²	$V^* =$ Mean values ≤ 0.21 Max values ≤ 0.45
Median Diameter (D_{50}) of Sediment Particles in Spawning Gravels	$D_{50} =$ Mean values ≥ 69 mm Minimum values ≥ 37 mm
Percent of Fine Fines (< 0.85 mm) in Spawning Gravels	Percent fine fines $\leq 21\%$
Percent of Coarse Fines (< 6.0 mm) in Spawning Gravels	Percent coarse fines $\leq 30\%$

Implementation

Nonpoint Source Policy

- dischargers must be regulated
- this TMDL proposes a prohibition
- discharges must implement control programs

Severity of Ill Effects (SEV) Scale

SEV		Description of Effect
Nil effect	0	No behavioral effect
Behavioral effects	1	Alarm reaction
	2	Abandonment of cover
	3	Avoidance response
Sublethal effects	4	Short-term reduction in feeding rates; short-term reduction in feeding success
	5	Minor physiological stress; increase in rate of coughing; increased respiration rate
	6	Moderate physiological stress
	7	Moderate habitat degradation; impaired homing
	8	Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition
Lethal and para-lethal effects	9	Reduced growth rate; delayed hatching; reduced fish density
	10	0-20% mortality; increased predation; moderate to severe habitat degradation
	11	>20%-40% mortality
	12	>40%-60% mortality
	13	>60%-80% mortality
	14	>80%-100% mortality

SEV Dose Response Matrix

Duration of exposure to SS (log_e hours)

		0	1	2	3	4	5	6	7	8	9	10		
		Average severity of ill effects scores (calculated)												
Concentration (mg SS/L)	162755	10	11	11	12	12	13	14	14	-	-	-	12	(log _e mg SS/L)
	59874	9	10	10	11	12	12	13	13	14	-	-	11	
	22026	8	9	10	10	11	11	12	13	13	14	-	10	
	8103	8	8	9	10	10	11	11	12	13	13	14	9	
	2981	7	8	8	9	9	10	11	11	12	12	13	8	
	1097	6	7	7	8	9	9	10	10	11	12	12	7	
	403	5	6	7	7	8	9	9	10	10	11	12	6	
	148	5	5	6	7	7	8	8	9	10	10	11	5	
	55	4	5	5	6	6	7	8	8	9	9	10	4	
	20	3	4	4	5	6	6	7	8	8	9	9	3	
	7	3	3	4	4	5	6	6	7	7	8	9	2	
	3	2	2	3	4	4	5	5	6	7	7	8	1	
	1	1	2	2	3	3	4	5	5	6	7	7	0	
		1	3	7	1	2	6	2	7	4	11	30		
		Hours			Days			Weeks		Months				

SEV-8 Thresholds

Exposure Category	SEV-8 Threshold		Concentration Range (SS mg/L)	log e Concentration (SS mg/L)
	Maximum Concentration (SS mg/L)	Duration (days)		
A	1808	1	665.14--1807.86	7
B	665	2	244.69--665.07	6
C	244	6	90.01--244.66	5
D	244	14	90.01--244.66	5
E	90	49	33.11--90.01	4
F	33	120	12.18--33.11	3
G	12	330	4.48--12.18	2

Background

- In 1998 Pajaro River, Llagas Creek, Rider Creek and San Benito River were listed as impaired due to sedimentation/siltation
- In 2000 Staff initiated a contract to study impairment, but this later “fell through”
- In 2001 and 2002 two contracts were established (one each for Upper and Lower Pajaro River)
- In 2003 and 2004 the two qualitative studies were completed
- In 2003 EPA funded a quantitative study

Basin Plan WQ Objective

General Water Quality Objective:

“The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.”

Timber Harvesting





Rural Properties

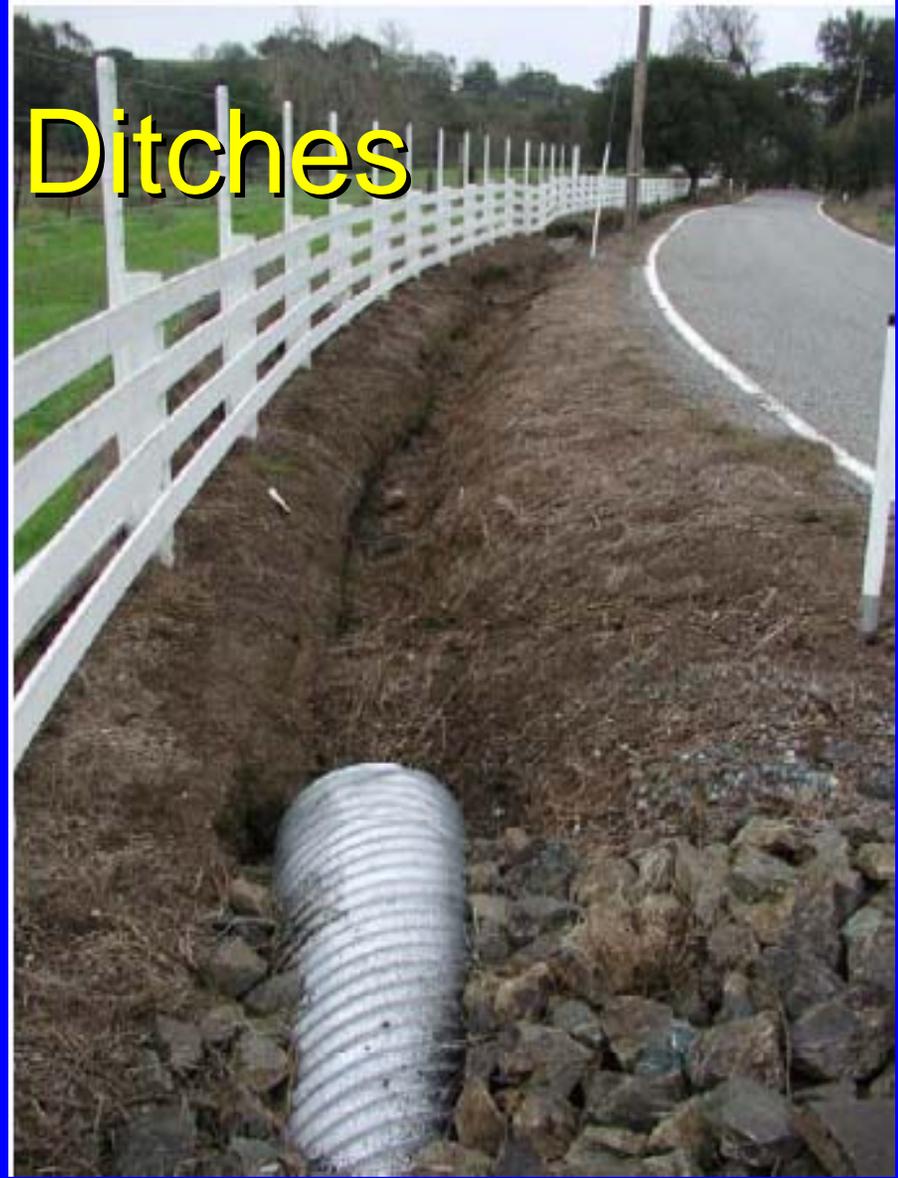
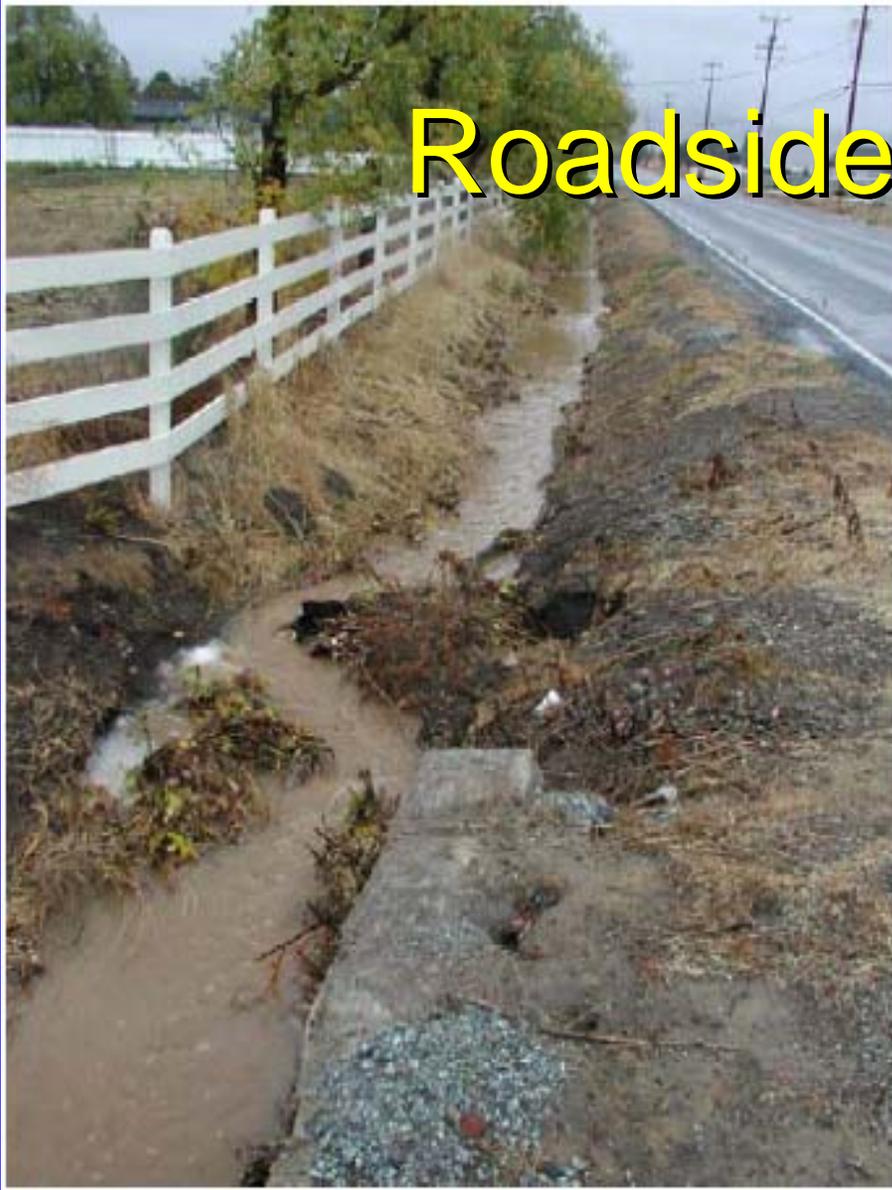
Agriculture



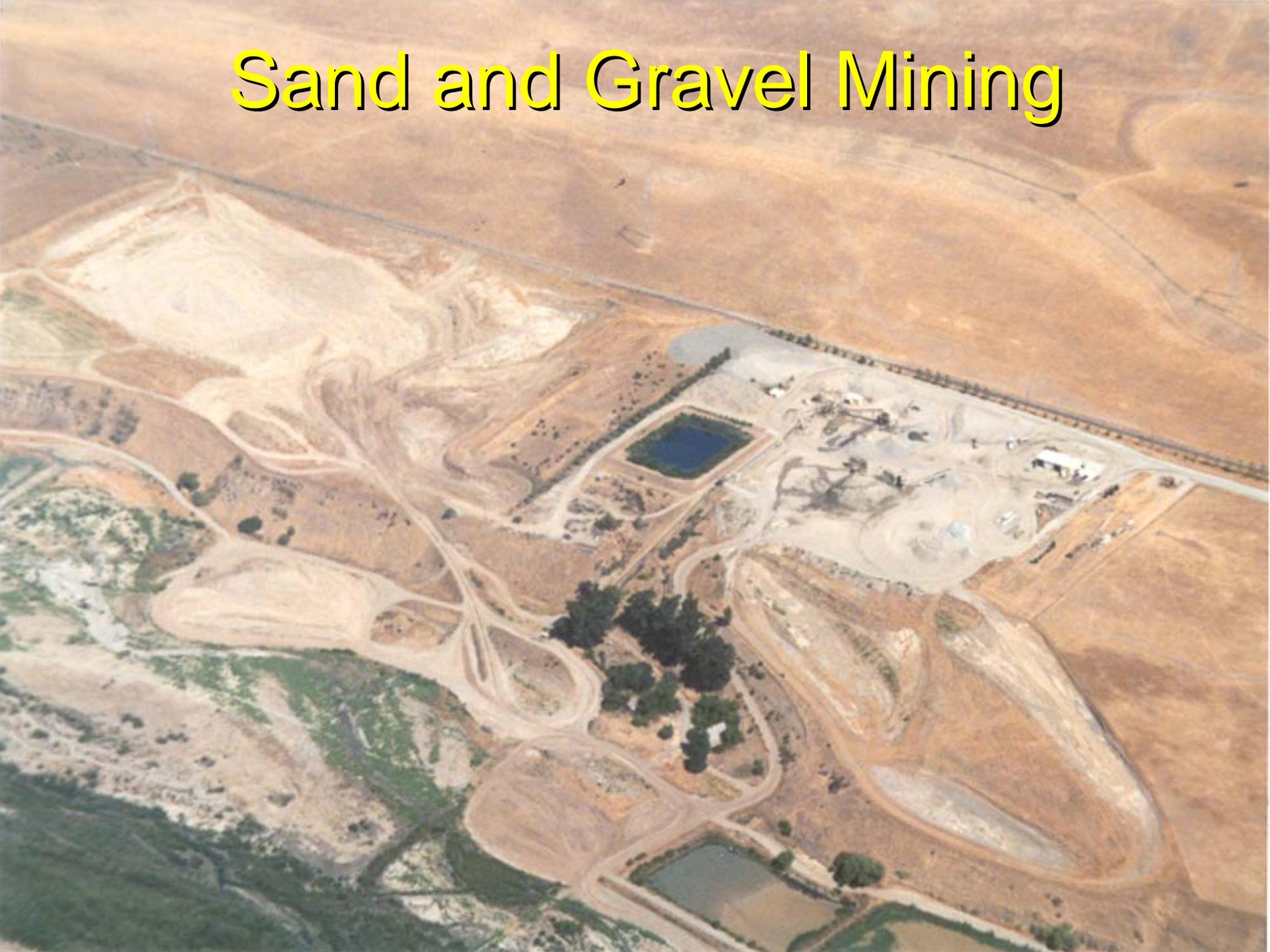
Grazing



Roadside Ditches



Sand and Gravel Mining





Road Drainage



Hydromod

Sediment Sources

- timber harvesting activities
- sand and gravel mining
- natural erosion and landslides
- municipal stormwater